

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference BA9323PCT	FOR FURTHER ACTION		See Form PCT/IPEA/416
International application No. PCT/US2004/042302	International filing date (day/month/year) 16.12.2004	Priority date (day/month/year) 19.12.2003	
International Patent Classification (IPC) or national classification and IPC C07D239/42, A01N43/54			
Applicant E.I. DUPONT DE NEMOURS AND COMPANY et al.			

<p>1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of 6 sheets, including this cover sheet.</p> <p>3. This report is also accompanied by ANNEXES, comprising:</p> <p>a. <input checked="" type="checkbox"/> <i>(sent to the applicant and to the International Bureau) a total of 11 sheets, as follows:</i></p> <ul style="list-style-type: none"> <input checked="" type="checkbox"/> sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions). <input type="checkbox"/> sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box. <p>b. <input type="checkbox"/> <i>(sent to the International Bureau only) a total of (indicate type and number of electronic carrier(s)) , containing a sequence listing and/or tables related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).</i></p>
<p>4. This report contains indications relating to the following items:</p> <ul style="list-style-type: none"> <input checked="" type="checkbox"/> Box No. I Basis of the opinion <input type="checkbox"/> Box No. II Priority <input checked="" type="checkbox"/> Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability <input type="checkbox"/> Box No. IV Lack of unity of invention <input checked="" type="checkbox"/> Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement <input type="checkbox"/> Box No. VI Certain documents cited <input type="checkbox"/> Box No. VII Certain defects in the international application <input type="checkbox"/> Box No. VIII Certain observations on the international application

Date of submission of the demand 17.10.2005	Date of completion of this report 29.11.2005
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**INTERNATIONAL PRELIMINARY REPORT
ON PATENTABILITY**

International application No.
PCT/US2004/042302

Box No. I Basis of the report

1. With regard to the **language**, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.
 - This report is based on translations from the original language into the following language, which is the language of a translation furnished for the purposes of:
 - international search (under Rules 12.3 and 23.1(b))
 - publication of the international application (under Rule 12.4)
 - international preliminary examination (under Rules 55.2 and/or 55.3)
2. With regard to the **elements*** of the international application, this report is based on (*replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report*):

Description, Pages

1-12, 14-47, 49-57, 60-142	as originally filed
13, 48, 58, 59	received on 17.10.2005 with letter of 05.10.2005

Claims, Numbers

1-8, 9(part)	as originally filed
9(part), 10-45	received on 17.10.2005 with letter of 05.10.2005

- a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing

3. The amendments have resulted in the cancellation of:
 - the description, pages
 - the claims, Nos.
 - the drawings, sheets/figs
 - the sequence listing (*specify*):
 - any table(s) related to sequence listing (*specify*):
4. This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).
 - the description, pages
 - the claims, Nos.
 - the drawings, sheets/figs
 - the sequence listing (*specify*):
 - any table(s) related to sequence listing (*specify*):

* If item 4 applies, some or all of these sheets may be marked "superseded."

**INTERNATIONAL PRELIMINARY REPORT
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Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability

1. The questions whether the claimed invention appears to be novel, to involve an inventive step (to be non-obvious), or to be industrially applicable have not been examined in respect of:
 - the entire international application,
 - claims Nos. 15-17
because:
 - the said international application, or the said claims Nos. relate to the following subject matter which does not require an international preliminary examination (specify):
 - the description, claims or drawings (*indicate particular elements below*) or said claims Nos. are so unclear that no meaningful opinion could be formed (*specify*):
 - the claims, or said claims Nos. are so inadequately supported by the description that no meaningful opinion could be formed.
 - no international search report has been established for the said claims Nos. 15-17
 - the nucleotide and/or amino acid sequence listing does not comply with the standard provided for in Annex C of the Administrative Instructions in that:
 - the written form has not been furnished
 does not comply with the standard
 - the computer readable form has not been furnished
 does not comply with the standard
 - the tables related to the nucleotide and/or amino acid sequence listing, if in computer readable form only, do not comply with the technical requirements provided for in Annex C-bis of the Administrative Instructions.
 - See separate sheet for further details

**INTERNATIONAL PRELIMINARY REPORT
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International application No.
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Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes: Claims	2-14,18-45
	No: Claims	1
Inventive step (IS)	Yes: Claims	
	No: Claims	1-14,18-45
Industrial applicability (IA)	Yes: Claims	1-14,18-45
	No: Claims	

2. Citations and explanations (Rule 70.7):

see separate sheet

**INTERNATIONAL PRELIMINARY
REPORT ON PATENTABILITY
(SEPARATE SHEET)**

International application No.
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Re Item III

Non-establishment of opinion with regard to novelty, inventive step and industrial applicability

1- Claims 15 to 17 relate to compounds not included in the general formula I of claim 1 since they lack the group R4. The International Search Report was based upon original claims 1 to 14 which related to the compounds of formula I.

Therefore, the subject matter of claims 15 to 17 was not searched.

In accordance with Rule 66.1 (e) PCT, claims 15 to 17 will not be examined during the International phase.

Re Item V

Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1- Reference is made to the following documents:

- d1: JOURNAL OF THE AMERICAN CHEMICAL SOCIETY, vol. 80, 5 June 1958 (1958-06-05), pages 2829-2832,
- d2: EP-A-0 136 976 (CIBA-GEIGY AG) 10 April 1985 (1985-04-10)
- d3: US-A-4 014 677 (FISCHER ET AL) 29 March 1977 (1977-03-29)

2- Novelty

D1 discloses on page 2832 the preparation of the 4-amino-5-cyano-6-(2-hydroxyethoxy)-2-phenylpyrimidine (see also page 2830, compound XII) which is regarded as encompassed by present formula (I). In this respect, it is observed that the group R defined as "herbicidally effective derivative of COOH" is interpreted as including also hydroxyalkyl moieties since the definition given for R2 in claim 2 includes also the group CH₂OR₁₃ wherein R₁₃ can be H. Hence, in the compound XII of d1, the group -OCH₂CH₂OH corresponds to present group R2, the cyano to R3, the amino to R4 and the phenyl to R1. The general formula (I) of d2 appears to encompass present formula (I) when R3 is NR₆R₇ and R1 is CN or a group XR₅ wherein R₅ is CH₂COA. Present compounds are considered novel vis-à-vis d2 on account of the specific combination of the variables R₂ and R₄.

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Present compounds differ from the compounds of d3 on account of the group R2.

3- Inventive step

3.1- The applicant has set himself the task of providing compounds useful for controlling undesirable vegetation. The experimental data disclosed in the application show that the compounds claimed, indeed posses this activity.

Document d2 relates to pyrimidine derivatives which inhibit the growth of vegetation and can therefore be used as plant growth regulators.

This document is regarded as the closest state of the art.

The technical problem can be seen in the provision of further compounds useful for controlling undesirable vegetation.

3.2- The solution to this problem, represented by present compounds of formula (I), is considered obvious. As indicated above, the formula (I) of d2 generically includes present compounds of formula (I). Many compounds exemplified in d1 are structurally very close to present compounds. For instance, the compounds 14, 29 and 46 differ from present compounds only in that they lack the group R2. However, d2 exemplifies also compounds containing groups corresponding to present group R2, e.g. compounds 525-527.

Taking into account of the whole teaching of d2, it appears that the skilled person would deduce that any compound included in the formula (I) would be useful as plant growth regulators.

It appears that the mere fact of selecting novel compounds inside the general formula (I) of d2 and observing that these novel compounds maintain the same properties known for the general formula (I) of d2, it is an activity which does not involve any inventive skill.

Also the combination in herbicidal mixtures of the compounds of the invention with the compounds known from the state of the art does not involve an inventive activity since it is a common practice in the agricultural field the simultaneous use of various biocides (cf. for instance d3, column 19).

Accordingly, the requirements of art. 33.3 are not met.

R⁴⁶ and R⁴⁷ are independently C₁–C₄ alkyl or C₁–C₃ haloalkyl; or
 R⁴⁶ and R⁴⁷ are taken together as -CH₂CH₂-, -CH₂CH(CH₃)- or -(CH₂)₃-;
 R⁴⁸ is H, C₁–C₄ alkyl, C₁–C₄ haloalkyl, C₂–C₄ alkylcarbonyl, C₂–C₄ alkoxy carbonyl
 or benzyl;

5 R⁴⁹ is H, C₁–C₄ alkyl or C₁–C₄ haloalkyl;

R⁵⁰, R⁵¹ and R⁵² are H; or a radical selected from C₁–C₁₄ alkyl, C₃–C₁₂ cycloalkyl,
 C₄–C₁₂ alkylcycloalkyl, C₄–C₁₂ cycloalkylalkyl, C₂–C₁₄ alkenyl and C₂–C₁₄
 alkynyl, each radical optionally substituted with 1–3 R²⁷;

Y is O, S or NR⁶¹;

10 R⁵³ is H, C₁–C₃ alkyl, C₁–C₃ haloalkyl, C₂–C₄ alkoxyalkyl, OH or C₁–C₃ alkoxy;

R⁵⁴ is C₁–C₃ alkyl, C₁–C₃ haloalkyl or C₂–C₄ alkoxyalkyl; or

R⁵³ and R⁵⁴ are taken together as -(CH₂)₂-, -CH₂CH(CH₃)- or -(CH₂)₃-;

R⁵⁵ and R⁵⁶ are independently C₁–C₄ alkyl;

R⁵⁷ is C₁–C₄ alkyl, C₁–C₃ haloalkyl or NR⁵⁹R⁶⁰;

15 each R⁵⁸ is independently selected from H and C₁–C₄ alkyl;

R⁵⁹ and R⁶⁰ are independently H or C₁–C₄ alkyl;

R⁶¹ is H, C₁–C₃ alkyl, C₁–C₃ haloalkyl or C₂–C₄ alkoxyalkyl;

m is an integer from 2 to 3; and

n is an integer from 1 to 4.

20 Embodiment 6. A compound of Formula I wherein when R¹ is optionally substituted
 cyclopropyl, then R² is other than alkoxyalkyl or alkylthioalkyl.

Embodiment 7. A compound of Formula I wherein R² is other than alkoxyalkyl or
 alkylthioalkyl.

Embodiment 8. A compound of Embodiment 5 wherein

25 R² is CO₂R¹², CH₂OR¹³, CH(OR⁴⁶)(OR⁴⁷), CHO, C(=NOR¹⁴)H, C(=NNR⁴⁸R⁴⁹)H,
 (O)_jC(R¹⁵)(R¹⁶)CO₂R¹⁷, C(=O)N(R¹⁸)R¹⁹, C(=S)OR⁵⁰, C(=O)SR⁵¹,
 C(=S)SR⁵² or C(=NR⁵³)YR⁵⁴;

R¹⁷ is C₁–C₁₀ alkyl optionally substituted with 1–3 R²⁹, or benzyl; and

each R²⁹ is independently halogen, C₁–C₄ alkoxy, C₁–C₄ haloalkoxy, C₁–C₄
 alkylthio, C₁–C₄ haloalkylthio, amino, C₁–C₄ alkylamino or C₂–C₄
 dialkylamino.

Embodiment 9. A compound of Embodiment 8 wherein when R² is CH₂OR¹³, then R¹³
 is other than alkyl.

Embodiment 10. A compound of Embodiment 8 wherein when R² is CH₂OR¹³, then
 35 R¹³ is other than optionally substituted alkyl.

Embodiment 11. A compound of Embodiment 8 wherein R² is other than CH₂OR¹³.

Embodiment 12. A compound of Embodiment 8 wherein j is 0.

MCPA-isoctyl, MCPA-thioethyl, mecoprop, clopyralid, aminopyralid, triclopyr, fluroxypyr, diflufenzopyr, imazapyr, imazethapyr, imazamox, picolinafen, oxyfluorfen, oxadiazon, carfentrazone-ethyl, sulfentrazone, flumioxazin, diflufenican, bromoxynil, propanil, thiobencarb, molinate, fluridone, mesotrione, sulcotrione, isoxaflutole, isoxaben, clomazone, 5 anilofos, beflubutamid, benfuresate, bentazone, benzobicyclon, benzofenap, bromobutide, butachlor, butamifos, cafenstrole, clomeprop, dimepiperate, dimethametryn, daimuron, esprocarb, etobenzanide, fentrazamid, indanofan, cumyluron, mefenacet, oxaziclofone, oxadiargyl, pentoxyzone, pyraclonil, pyrazolate, pyributicarb, pyriftalid, pyriminobac-methyl, thenylchlor, bispyribac-sodium, clefoxydim, copper sulfate, cinosulfuron, 10 cyclosulfamuron, ethoxysulfuron, epoprodan, flucetosulfuron, imazosulfuron, metamifop, pyrazosulfuron-ethyl, quinclorac, flucarbazone-sodium, propoxycarbazone-sodium, amicarbazone, florasulam, triasulfuron, triaziflam, pinoxaden, tritosulfuron, amidosulfuron, metosulam, sulfosulfuron, pyraflufen-ethyl, HOK-201, KUH-021 and CUH-35. Specifically preferred mixtures (compound numbers refer to compounds in Index Tables A-D) are selected from the group: compound 4 and diuron; compound 9 and diuron; compound 58 and diuron; compound 64 and diuron; compound 65 (and salts thereof) and diuron; compound 94 and diuron; compound 95 (and salts thereof) and diuron; compound 96 and diuron; compound 135 (and salts thereof) and diuron; compound 4 and hexazinone; compound 9 and hexazinone; compound 58 and hexazinone; compound 64 and hexazinone; 15 compound 65 (and salts thereof) and hexazinone; compound 94 and hexazinone; compound 95 (and salts thereof) and hexazinone; compound 96 and hexazinone; compound 135 (and salts thereof) and hexazinone; compound 4 and terbacil; compound 9 and terbacil; compound 58 and terbacil; compound 64 and terbacil; compound 65 (and salts thereof) and terbacil; compound 94 and terbacil; compound 95 (and salts thereof) and terbacil; compound 20 96 and terbacil; compound 135 (and salts thereof) and terbacil; compound 4 and bromacil; compound 9 and bromacil; compound 58 and bromacil; compound 64 and bromacil; compound 65 (and salts thereof) and bromacil; compound 94 and bromacil; compound 95 (and salts thereof) and bromacil; compound 96 and bromacil; compound 135 (and salts thereof) and bromacil; compound 4 and glyphosate; compound 9 and glyphosate; compound 58 and glyphosate; compound 64 and glyphosate; compound 65 (and salts thereof) and glyphosate; compound 94 and glyphosate; compound 95 (and salts thereof) and glyphosate; compound 96 and glyphosate; compound 135 (and salts thereof) and glyphosate; compound 4 and glufosinate; compound 9 and glufosinate; compound 58 and glufosinate; compound 64 and glufosinate; compound 65 (and salts thereof) and glufosinate; compound 25 94 and glufosinate; compound 95 (and salts thereof) and glufosinate; compound 96 and glufosinate; compound 135 (and salts thereof) and glufosinate; compound 4 and azimsulfuron; compound 9 and azimsulfuron; compound 58 and azimsulfuron; compound 64 and azimsulfuron; compound 65 (and salts thereof) and azimsulfuron; compound 94 and

(and salts thereof) and butachlor; compound 4 and cafenstrole; compound 9 and cafenstrole; compound 58 and cafenstrole; compound 64 and cafenstrole; compound 65 (and salts thereof) and cafenstrole; compound 94 and cafenstrole; compound 95 (and salts thereof) and cafenstrole; compound 96 and cafenstrole; compound 135 (and salts thereof) and cafenstrole; compound 4 and clomeprop; compound 9 and clomeprop; compound 58 and clomeprop; compound 64 and clomeprop; compound 65 (and salts thereof) and clomeprop; compound 94 and clomeprop; compound 95 (and salts thereof) and clomeprop; compound 96 and clomeprop; compound 135 (and salts thereof) and clomeprop; compound 4 and dimepiperate; compound 9 and dimepiperate; compound 58 and dimepiperate; compound 64 and dimepiperate; compound 65 (and salts thereof) and dimepiperate; compound 94 and dimepiperate; compound 95 (and salts thereof) and dimepiperate; compound 96 and dimepiperate; compound 135 (and salts thereof) and dimepiperate; compound 4 and dimethametryn; compound 9 and dimethametryn; compound 58 and dimethametryn; compound 64 and dimethametryn; compound 65 (and salts thereof) and dimethametryn; compound 94 and dimethametryn; compound 95 (and salts thereof) and dimethametryn; compound 96 and dimethametryn; compound 135 (and salts thereof) and dimethametryn; compound 4 and diamuron; compound 9 and diamuron; compound 58 and diamuron; compound 64 and diamuron; compound 65 (and salts thereof) and diamuron; compound 94 and diamuron; compound 95 (and salts thereof) and diamuron; compound 96 and diamuron; compound 135 (and salts thereof) and diamuron; compound 4 and esprocarb; compound 9 and esprocarb; compound 58 and esprocarb; compound 64 and esprocarb; compound 65 (and salts thereof) and esprocarb; compound 94 and esprocarb; compound 95 (and salts thereof) and esprocarb; compound 96 and esprocarb; compound 135 (and salts thereof) and esprocarb; compound 4 and etobenzanide; compound 9 and etobenzanide; compound 58 and etobenzanide; compound 64 and etobenzanide; compound 65 (and salts thereof) and etobenzanide; compound 94 and etobenzanide; compound 95 (and salts thereof) and etobenzanide; compound 96 and etobenzanide; compound 135 (and salts thereof) and etobenzanide; compound 4 and fentrazamid; compound 9 and fentrazamid; compound 58 and fentrazamid; compound 64 and fentrazamid; compound 65 (and salts thereof) and fentrazamid; compound 94 and fentrazamid; compound 95 (and salts thereof) and fentrazamid; compound 96 and fentrazamid; compound 135 (and salts thereof) and fentrazamid; compound 4 and indanofan; compound 9 and indanofan; compound 58 and indanofan; compound 64 and indanofan; compound 65 (and salts thereof) and indanofan; compound 94 and indanofan; compound 95 (and salts thereof) and indanofan; compound 96 and indanofan; compound 135 (and salts thereof) and indanofan; compound 4 and cumyluron; compound 9 and cumyluron; compound 58 and cumyluron; compound 64 and cumyluron; compound 65 (and salts thereof) and cumyluron; compound 94 and cumyluron; compound 95 (and salts thereof) and cumyluron; compound 96 and cumyluron; compound 135 (and salts thereof) and cumyluron;

6-amino-5-chloro-2-(4-chlorophenyl)-4-pyrimidinecarboxylic acid,
ethyl 6-amino-2-(4-bromophenyl)-5-chloro-4-pyrimidinecarboxylate,
methyl 6-amino-2-(4-bromophenyl)-5-chloro-4-pyrimidinecarboxylate, and
6-amino-2-(4-bromophenyl)-5-chloro-4-pyrimidinecarboxylic acid.

5 10. A herbicidal mixture comprising a herbicidally effective amount of a compound of Claim 1 and an effective amount of at least one additional active ingredient selected from the group consisting of an other herbicide and a herbicide safener.

11. A herbicidal mixture comprising synergistically effective amounts of a compound of Claim 1 and an auxin transport inhibitor.

10 12. A herbicidal composition comprising a herbicidally effective amount of a compound of Claim 1 and at least one of a surfactant, a solid diluent or a liquid diluent.

13. A method for controlling the growth of undesired vegetation comprising contacting the vegetation or its environment with a herbicidally effective amount of a compound of Claim 1.

15 14. A herbicidal composition comprising a herbicidally effective amount of a compound of Claim 1, an effective amount of at least one additional active ingredient selected from the group consisting of an other herbicide and a herbicide safener, and at least one of a surfactant, a solid diluent or a liquid diluent.

20 15. A compound which is 2-cyclopropyl-1,6-dihydro-6-oxo-4-pyrimidinecarboxylic acid.

16. A compound which is 5-chloro-2-cyclopropyl-1,6-dihydro-6-oxo-4-pyrimidinecarboxylic acid.

17. A compound which is 5,6-dichloro-2-cyclopropyl-4-pyrimidinecarboxylic acid.

18. The compound of Claim 1 selected from the group consisting of:

25 methyl 6-amino-5-bromo-2-cyclopropyl-4-pyrimidinecarboxylate,
ethyl 6-amino-5-bromo-2-cyclopropyl-4-pyrimidinecarboxylate,
phenylmethyl 6-amino-5-bromo-2-cyclopropyl-4-pyrimidinecarboxylate,
6-amino-5-bromo-2-cyclopropyl-4-pyrimidinecarboxylic acid monosodium salt,
6-amino-5-chloro-2-cyclopropyl-4-pyrimidinecarboxylic acid,
30 methyl 6-amino-5-chloro-2-cyclopropyl-4-pyrimidinecarboxylate,
phenylmethyl 6-amino-5-chloro-2-cyclopropyl-4-pyrimidinecarboxylate,

6-amino-5-chloro-2-cyclopropyl-4-pyrimidinecarboxylic acid monosodium salt,
6-amino-5-bromo-2-cyclopropyl-4-pyrimidinecarboxylic acid,
ethyl 6-amino-5-chloro-2-cyclopropyl-4-pyrimidinecarboxylate,
methyl 6-amino-5-chloro-2-(4-chlorophenyl)-4-pyrimidinecarboxylate,
5 ethyl 6-amino-5-chloro-2-(4-chlorophenyl)-4-pyrimidinecarboxylate,
6-amino-5-chloro-2-(4-chlorophenyl)-4-pyrimidinecarboxylic acid,
ethyl 6-amino-2-(4-bromophenyl)-5-chloro-4-pyrimidinecarboxylate,
methyl 6-amino-2-(4-bromophenyl)-5-chloro-4-pyrimidinecarboxylate, and
6-amino-2-(4-bromophenyl)-5-chloro-4-pyrimidinecarboxylic acid.

10 19. The compound of claim 18 selected from the group consisting of:
ethyl 6-amino-5-chloro-2-cyclopropyl-4-pyrimidinecarboxylate,
methyl 6-amino-5-chloro-2-cyclopropyl-4-pyrimidinecarboxylate,
methyl 6-amino-5-chloro-2-(4-chlorophenyl)-4-pyrimidinecarboxylate,
ethyl 6-amino-5-chloro-2-(4-chlorophenyl)-4-pyrimidinecarboxylate,
15 6-amino-5-chloro-2-(4-chlorophenyl)-4-pyrimidinecarboxylic acid,
ethyl 6-amino-2-(4-bromophenyl)-5-chloro-4-pyrimidinecarboxylate,
6-amino-2-(4-bromophenyl)-5-chloro-4-pyrimidinecarboxylic acid,
methyl 6-amino-2-(4-bromophenyl)-5-chloro-4-pyrimidinecarboxylate, and
6-amino-5-chloro-2-cyclopropyl-4-pyrimidinecarboxylic acid.

20 20. A compound of claim 1 which is 6-amino-5-bromo-2-cyclopropyl-4-pyrimidinecarboxylic acid.

21. A compound of claim 1 which is methyl 6-amino-5-bromo-2-cyclopropyl-4-pyrimidinecarboxylate.

22. A compound of claim 1 which is methyl 6-amino-5-chloro-2-(4-chlorophenyl)-4-pyrimidinecarboxylate.

25 23. A compound of claim 1 which is ethyl 6-amino-5-chloro-2-(4-chlorophenyl)-4-pyrimidinecarboxylate.

24. A compound of claim 1 which is 6-amino-5-chloro-2-(4-chlorophenyl)-4-pyrimidinecarboxylic acid.

25. A compound of claim 1 which is 6-amino-5-chloro-2-cyclopropyl-4-pyrimidinecarboxylic acid.

26. A compound of claim 1 which is ethyl 6-amino-5-bromo-2-cyclopropyl-4-pyrimidinecarboxylate.

5 27. A compound of claim 1 which is methyl 6-amino-5-chloro-2-cyclopropyl-4-pyrimidinecarboxylate.

28. A compound of claim 1 which is ethyl 6-amino-5-chloro-2-cyclopropyl-4-pyrimidinecarboxylate.

10 29. A herbicidal mixture comprising a herbicidally effective amount of a compound of claims 18 or 19, and an effective amount of at least one additional active ingredient selected from the group consisting of an other herbicide and a herbicide safener.

30. The herbicidal mixture of claim 10 wherein the additional active ingredient is selected from the group consisting of:

15 amidosulfuron, azimsulfuron, bensulfuron-methyl, bispyribac, bispyribac-sodium, chlorimuron-ethyl, chlorsulfuron, cinosulfuron, cloransulam-methyl, cyclosulfamuron, diclosulam, ethametsulfuron-methyl, ethoxysulfuron, flazasulfuron, florasulam, flucarbazone, flucarbazone-sodium, flucetosulfuron, flumetsulam, flupyrifos-methyl, flupyrifos-methyl-sodium, foramsulfuron, halosulfuron-methyl, imazamethabenz-methyl, imazamox, imazapic, imazapyr, imazaquin, imazaquin-ammonium, imazethapyr, 20 imazosulfuron, iodosulfuron-methyl, mesosulfuron-methyl, metosulam, metsulfuron-methyl, nicosulfuron, oxasulfuron, penoxsulam, primisulfuron-methyl, propoxycarbazone, propoxycarbazone-sodium, prosulfuron, pyrazosulfuron-ethyl, pyribenzoxim, pyrifluralid, pyriminobac-methyl, pyrithiobac, pyrithiobac-sodium, rimsulfuron, sulfometuron-methyl, sulfosulfuron, thifensulfuron-methyl, triasulfuron, tribenuron-methyl, trifloxsulfuron, 25 triflusulfuron-methyl and tritosulfuron.

31. The herbicidal mixture of claim 30 wherein the additional active ingredient is in combination with at least one other active ingredient to form a combination of active ingredients selected from the group consisting of:

chlorsulfuron and flucarbazone-sodium;

30 chlorsulfuron and sulfometuron-methyl;

flumetsulam, nicosulfuron and rimsulfuron;

mesosulfuron-methyl and iodosulfuron-methyl;

metsulfuron-methyl and chlorsulfuron;

metsulfuron-methyl and sulfometuron-methyl;
metsulfuron-methyl, thifensulfuron-methyl and tribenuron-methyl;
imazapyr and metsulfuron-methyl;
imazapyr, metsulfuron-methyl and sulfometuron-methyl;
5 imazapyr and sulfometuron-methyl;
rimsulfuron and nicosulfuron;
rimsulfuron and thifensulfuron-methyl;
thifensulfuron-methyl and metsulfuron-methyl;
tribenuron-methyl and metsulfuron-methyl;
10 tribenuron-methyl and thifensulfuron-methyl;
bensulfuron-methyl and metsulfuron-methyl; and
metsulfuron-methyl and chlorimuron-ethyl.

32. The herbicidal mixture of claim 29 wherein the additional active ingredient is selected from the group consisting of:

15 amidosulfuron, azimsulfuron, bensulfuron-methyl, bispyribac, bispyribac-sodium, chlorimuron-ethyl, chlorsulfuron, cinosulfuron, cloransulam-methyl, cyclosulfamuron, diclosulam, ethametsulfuron-methyl, ethoxysulfuron, flazasulfuron, florasulam, flucarbazone, flucarbazone-sodium, flucetosulfuron, flumetsulam, flupyrifos-methyl, flupyrifos-methyl-sodium, foramsulfuron, halosulfuron-methyl, imazamethabenz-
20 methyl, imazamox, imazapic, imazapyr, imazaquin, imazaquin-ammonium, imazethapyr, imazosulfuron, iodosulfuron-methyl, mesosulfuron-methyl, metosulam, metsulfuron-methyl, nicosulfuron, oxasulfuron, penoxsulam, primisulfuron-methyl, propoxycarbazone, propoxycarbazone-sodium, prosulfuron, pyrazosulfuron-ethyl, pyribenzoxim, pyriflatalid, pyriminobac-methyl, pyrithiobac, pyrithiobac-sodium, rimsulfuron, sulfometuron-methyl;
25 sulfosulfuron, thifensulfuron-methyl, triasulfuron, tribenuron-methyl, trifloxyulfuron, triflusulfuron-methyl and tritosulfuron.

33. The herbicidal mixture of claim 32 wherein the additional active ingredient is in combination with at least one other active ingredient to form a combination of active ingredients selected from the group consisting of:

30 chlorsulfuron and flucarbazone-sodium;
chlorsulfuron and sulfometuron-methyl;
flumetsulam, nicosulfuron and rimsulfuron;

mesosulfuron-methyl and iodosulfuron-methyl;
metsulfuron-methyl and chlorsulfuron;
metsulfuron-methyl and sulfometuron-methyl;
metsulfuron-methyl, thifensulfuron-methyl and tribenuron-methyl;

5 imazapyr and metsulfuron-methyl;
imazapyr, metsulfuron-methyl and sulfometuron-methyl;
imazapyr and sulfometuron-methyl;
rimsulfuron and nicosulfuron;
rimsulfuron and thifensulfuron-methyl;

10 thifensulfuron-methyl and metsulfuron-methyl;
tribenuron-methyl and metsulfuron-methyl;
tribenuron-methyl and thifensulfuron-methyl;
bensulfuron-methyl and metsulfuron-methyl; and
metsulfuron-methyl and chlorimuron-ethyl.

15 34. A herbicidal mixture comprising synergistically effective amounts of a compound of either of claims 18 or 19 and an auxin transport inhibitor.

35. The herbicidal mixture of claim 11 wherein the compound is selected from the group consisting of :

20 ethyl 6-amino-5-chloro-2-cyclopropyl-4-pyrimidinecarboxylate,
methyl 6-amino-5-chloro-2-cyclopropyl-4-pyrimidinecarboxylate,
methyl 6-amino-5-chloro-2-(4-chlorophenyl)-4-pyrimidinecarboxylate,
ethyl 6-amino-5-chloro-2-(4-chlorophenyl)-4-pyrimidinecarboxylate,
6-amino-5-chloro-2-(4-chlorophenyl)-4-pyrimidinecarboxylic acid,
ethyl 6-amino-2-(4-bromophenyl)-5-chloro-4-pyrimidinecarboxylate,
25 6-amino-2-(4-bromophenyl)-5-chloro-4-pyrimidinecarboxylic acid,
methyl 6-amino-2-(4-bromophenyl)-5-chloro-4-pyrimidinecarboxylate and
6-amino-5-chloro-2-cyclopropyl-4-pyrimidinecarboxylic acid, and the auxin transport inhibitor is diflufenzopyr.

36. The herbicidal mixture of claim 11 wherein the compound is ethyl 6-amino-5-bromo-2-cyclopropyl-4-pyrimidinecarboxylate and the auxin transport inhibitor is diflufenzopyr.

37. The herbicidal mixture of claim 29 further comprising at least one of a surfactant, a solid diluent or a liquid diluent.

38. The herbicidal mixture of claim 34 further comprising at least one of a surfactant, a solid diluent or a liquid diluent.

39. The herbicidal mixture of claim 37 wherein the additional active ingredient is selected from the group consisting of:

10 amidosulfuron, azimsulfuron, bensulfuron-methyl, bispyribac, bispyribac-sodium, chlorimuron-ethyl, chlorsulfuron, cinosulfuron, cloransulam-methyl, cyclosulfamuron, diclosulam, ethametsulfuron-methyl, ethoxysulfuron, flazasulfuron, florasulam, flucarbazone, flucarbazone-sodium, flucetosulfuron, flumetsulam, flupyrifluron-methyl, flupyrifluron-methyl-sodium, foramsulfuron, halosulfuron-methyl, imazamethabenz-15 methyl, imazamox, imazapic, imazapyr, imazaquin, imazaquin-ammonium, imazethapyr, imazosulfuron, iodosulfuron-methyl, mesosulfuron-methyl, metosulam, metsulfuron-methyl, nicosulfuron, oxasulfuron, penoxsulam, primisulfuron-methyl, propoxycarbazone, propoxycarbazone-sodium, prosulfuron, pyrazosulfuron-ethyl, pyribenzoxim, pyriflatalid, pyriminobac-methyl, pyrithiobac, pyrithiobac-sodium, rimsulfuron, sulfometuron-methyl, 20 sulfosulfuron, thifensulfuron-methyl, triasulfuron, tribenuron-methyl, trifloxysulfuron, triflusulfuron-methyl and tritosulfuron.

40. The herbicidal mixture of claim 39 wherein the additional active ingredient is in combination with at least one other active ingredient to form a combination of active ingredients selected from the group consisting of:

25 chlorsulfuron and flucarbazone-sodium;
chlorsulfuron and sulfometuron-methyl;
flumetsulam, nicosulfuron and rimsulfuron;
mesosulfuron-methyl and iodosulfuron-methyl;
metsulfuron-methyl and chlorsulfuron;
30 metsulfuron-methyl and sulfometuron-methyl;
metsulfuron-methyl, thifensulfuron-methyl and tribenuron-methyl;
imazapyr and metsulfuron-methyl;
imazapyr, metsulfuron-methyl and sulfometuron-methyl;

imazapyr and sulfometuron-methyl;
rimsulfuron and nicosulfuron;
rimsulfuron and thifensulfuron-methyl;
thifensulfuron-methyl and metsulfuron-methyl;
5 tribenuron-methyl and metsulfuron-methyl;
tribenuron-methyl and thifensulfuron-methyl;
bensulfuron-methyl and metsulfuron-methyl; and
metsulfuron-methyl and chlorimuron-ethyl.

10 41. The herbicidal mixture of claim 32 wherein the mixture has a greater than additive effect on weeds or a less than additive effect on crops or other desirable plants.

42. The herbicidal mixture of claim 33 wherein the mixture has a greater than additive effect on weeds or a less than additive effect on crops or other desirable plants.

43. A method for controlling the growth of undesired vegetation comprising contacting the vegetation or its environment with the herbicidal mixture of claim 32.

15 44. A method for controlling the growth of undesired vegetation comprising contacting the vegetation or its environment with the herbicidal mixture of claim 33.

45. A method for controlling the growth of undesired vegetation comprising contacting the vegetation or its environment with the herbicidal mixture of claim 34.